

**REPLACED BY
ART 34 AMDT****CLAIMS**

What is claimed is:

1. An image generation system for developing three-dimensional electronic models of objects, the image generation system comprising:

5 a scanner operable to scan an object and provide scanner position information and image data representative of the object; and

a computing system in communication with the scanner, where the computing system is operable to generate a three-dimensional electronic model of the object as a function of the image data and the scanner position information.

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2. The image generation system of claim 1, where the scanner includes a satellite positioning system and a slope orientation sensor operable to provide the scanner position information.

15 3. The image generation system of claim 2, where the slope orientation sensor is operable to provide a pitch, a roll and an orientation of the scanner.

4. The image generation system of claim 1, where the scanner includes a laser scanner operable to provide geometric point data representative of a geometric shape
20 of the object.

5. The image generation system of claim 1, where the scanner includes a point scanner and a color scanner, the point scanner and the color scanner operable to synchronously provide image data representative of a geometric shape and a color of
25 the object.

6. The image generation system of claim 1, where the scanner includes a point scanner operable to collect geometric point data representative of the geometric shape of the object, a color scanner operable to collect color point data representative of the
30 color of the object and a positioning system operable to collect the scanner position information.

7. The image generation system of claim 6, where the computing system is operable to associate the color point data, the geometric point data, and the scanner position information to form a three-dimensional electronic image representative of only one scan of the object.

8. The image generation system of claim 7, where the computing system is operable to selectively combine a plurality of three-dimensional electronic images as a function of the scanner position information to generate a three-dimensional electronic model.

9. An image generation system for developing three-dimensional electronic models of objects, the image generation system comprising:

a point scanner operable to generate a plurality of point clouds representative of an object as a function of a plurality of respective scans of the object from a plurality of respective geographic positions;

a color scanner synchronously operating with the point scanner, where the color scanner is operable to generate color point data representative of the color of the object for each of the point clouds;

a positioning system operable to provide position information of the point scanner and the color scanner for each of the geographic positions; and

a computing system operable to develop a three-dimensional electronic model as a function of the point clouds, the color point data and the position information.

10. The image generation system of claim 9, where the color scanner is a line sensor operable to measure a line of color in a determined area of the object, while at the same time the point scanner is operable to measure distances from a plurality of points within the same determined area.

11. The image generation system of claim 9, where the each of the point clouds includes geometric point data generated by the point scanner and the computing

17. The image generation system of claim 9, where the three-dimensional electronic model includes a simple layer, a construction layer, a position layer and a library layer.

5 18. An image generation system for developing three-dimensional electronic models of objects, the image generation system comprising:

means for scanning an object, where the means for scanning is operable to determine position information of the means for scanning an object and image data representative of the object; and

10 a computing system in communication with the means for scanning, where the computing system is operable to generate a three-dimensional electronic model of the object as a function of the image data and the position information.

15 19. The image generation system of claim 18, where the means for scanning includes means for determining navigational coordinates and means for determining slope, orientation and height of the means for scanning.

20 20. The image generation system of claim 19, where the computing system includes means for geometrically assembling the three-dimensional electronic model as a function of the navigational coordinates, the slope, orientation and height.

21. The image generation system of claim 18, where the computing system includes means for joining a plurality of geometric points included in the image data, to form three-dimensional electronic images.

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22. The image generation system of claim 21, where the computing system includes means for manipulating the three-dimensional electronic images.

30 23. The image generation system of claim 21, where the computing system includes means for combining the three-dimensional electronic images to form the three-dimensional electronic model.

24. The image generation system of claim 18, where the computing system includes means for texturizing surfaces of the three-dimensional electronic model.

25. An image generation system for developing three-dimensional electronic models of objects, the image generation system comprising:

a computer system;

the computer system having means for assembling a plurality of point clouds into a three-dimensional electronic model representative of an object;

the computer system having means for generating a plurality of surfaces of the three-dimensional electronic model;

the computer system having means for texturizing the surfaces; and

the computer system having means for visually rendering the three-dimensional electronic model with texturized surfaces.

26. The image generation system of claim 25, further comprising the computer system having means for capturing a plurality of scans of an object, where each of the scans include a plurality of geometric points forming each of the point clouds.

27. The image generation system of claim 25, further comprising the computer system having means for applying color in association with each of a plurality of geometric points in each of the point clouds.

28. The image generation system of claim 25, further comprising means for scanning the object to develop the point cloud representative of the object.

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29. An image generation system for developing three-dimensional electronic models of objects, the image generation system comprising:

a memory device;

instructions in the memory device to store a plurality of three-dimensional electronic images, where each of the three-dimensional electronic images includes image data and position information captured during a scan of an object;

instructions in the memory device to join a plurality of geometric points

included in the image data of each of the three-dimensional electronic images; and
instructions in the memory device to combine the three-dimensional electronic
images to form a three-dimensional electronic model as a function of the position
information.

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30. The image generation system of claim 29, further comprising instructions in
the memory device to texturize the three-dimensional electronic model.

31. The image generation system of claim 29, where the instructions in the
memory device to join geometric points comprise instructions in the memory device
to form surfaces within each of the three-dimensional electronic images.

32. The image generation system of claim 29, where the instructions in the
memory device to join the geometric points comprise instructions in the memory
device to partition each of the three-dimensional electronic images into sub-images.

33. The image generation system of claim 32, where the instructions in the
memory device to join the geometric points comprise instructions in the memory
device to develop a plurality of lines, where each of the lines is representative of one
of the sub-images.

34. The image generation system of claim 33, where the instructions in the
memory device to combine the three-dimensional electronic images comprise
instructions in the memory device to position the lines with respect to each other.

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35. The image generation system of claim 29, where the instructions in the
memory device to combine the three-dimensional electronic images comprise
instructions in the memory device to positionally manipulate the three-dimensional
electronic images with respect to each other.

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36. A method of developing a three-dimensional electronic model representative
of an object, the method comprising:

performing a scan of an object in each of a plurality of geographic positions;
collecting image data and position information during each scan;
developing a three-dimensional electronic image representative of each scan
from the image data and the position information collected during the scan; and

5 combining a plurality of three-dimensional electronic images as a function of
the position information to form a three-dimensional electronic model representative
of the object.

37. The method of claim 36, where performing a scan comprises determining
10 geometric points representative of the geometric shape of the object.

38. The method of claim 36, where performing a scan comprises determining
color point data in a line of color within an area while determining geometric point
data within the same area.

15 39. The method of claim 36, where collecting image data and position information
comprises synchronously collecting geometric point data and color point data
representative of the object.

20 40. The method of claim 36, where collecting image data and position information
comprises determining navigational coordinates, a facing direction, a pitch, a roll and
a height of a scanner used to perform the scan.

41. The method of claim 36, where combining a plurality of three-dimensional
25 electronic images comprises associating the image data and the position information.

42. The method of claim 36, where combining a plurality of three-dimensional
electronic images comprises manipulating at least a portion of the three-dimensional
electronic images with respect to each other.

30 43. The method of claim 36, further comprising selecting a source texture as a
function of a texture of the object; developing a transformation procedure to create a

complex texture from the source texture; and associating the transformation procedure with a surface of the three-dimensional electronic model.

44. The method of claim 36, where the object includes a symmetrical portion and
5 developing a three-dimensional electronic image comprises mirroring the image data from a scanned portion of the object to the symmetrical portion of the object.

45. A method of developing a three-dimensional electronic model representative of an object, the method comprising:
10 scanning an object with a scanner from a plurality of positions to develop a respective plurality of three-dimensional electronic images, where each of the three-dimensional electronic images is represented with a plurality of geometric points in a point cloud;
portioning one of the three-dimensional electronic images into a plurality of
15 sub-images;
converting the geometric points into a plurality of lines representative of the respective sub-images; and
combining the lines to develop a three-dimensional electronic model.

20 46. The method of claim 45, where converting the geometric points comprises storing the lines representative of the sub-images as an outline data file.

47. The method of claim 45, where scanning an object comprises scanning from a plurality of positions to generate a plurality of respective point clouds.

25 48. The method of claim 45, where combining the lines comprises manipulating the lines with respect to each other to precisely fit together.

49. The method of claim 45, where combining the lines comprises minimizing
30 error in the distance between one of the lines and another of the lines.

50. The method of claim 45, further comprising compensating for height when the resting surface that the object rests upon is sloped.

51. The method of claim 45, further comprising filling gaps in color in the three-dimensional electronic model by rasterization.

52. The method of claim 45, further comprising dividing a surface of each of the three-dimensional electronic images into triangles and color blending within each of the triangles to fill gaps in color.

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53. A method of developing a three-dimensional electronic model representative of an object, the method comprising:

capturing a plurality of scans of an object, where each of the scans includes image data representative of a three-dimensional electronic image and position information indicative of the position from which each scan was captured;

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combining the scans to form a three-dimensional electronic model of the object as a function of the position information; and

texturizing the three-dimensional electronic model as a function of a source texture.

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54. The method of claim 53, where texturizing comprises associating a texture with a surface of the three-dimensional electronic model.

55. The method of claim 53, where texturizing comprises selecting a source texture, creating a transformation procedure to transform the source texture to form a complex texture, and associating the transformation procedure with a surface of the three-dimensional electronic model.

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56. The method of claim 53, further comprising organizing the three-dimensional electronic model into a structure that includes a plurality of layers.

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57. The method of claim 53, where texturizing comprises searching a library of source textures, transforming a source texture to form a complex texture for a surface of the three-dimensional electronic model and storing in the library a transformation procedure to form the complex texture.

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58. The method of claim 53, further comprising storing the three-dimensional electronic model as a datafile.

59. The method of claim 58, further comprising accessing the datafile to display
10 the three-dimensional electronic model in an electronic map.